

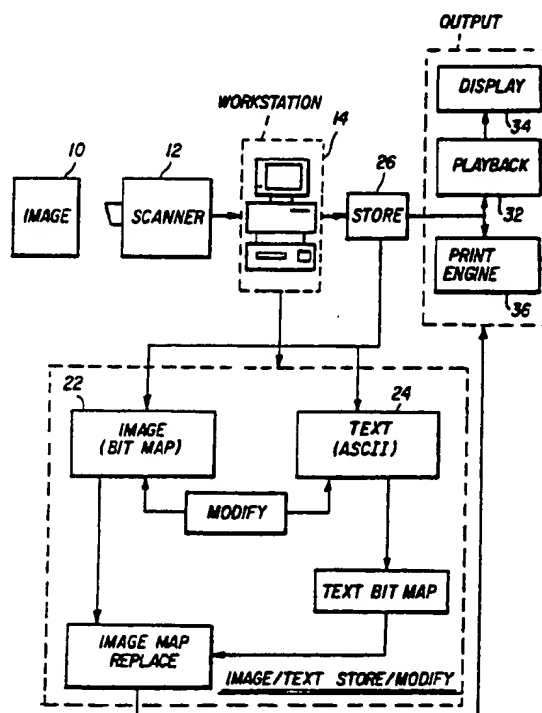


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| (21) International Application Number: PCT/US91/09560 (22) International Filing Date: 24 December 1991 (24.12.91) (30) Priority data: 637,832 7 January 1991 (07.01.91) US (71) Applicant: EASTMAN KODAK COMPANY [US/US]; 343 State Street, Rochester, NY 14650 (US). (72) Inventor: O'BRIEN, Donald, Edward ; 2364 Elton Road, Holcomb, NY 14469 (US). (74) Agent: DUGAS, Edward; 343 State Street, Rochester, NY 14650-2201 (US). | | (81) Designated States: AT (European patent), BE (European patent), CA, CH (European patent), DE (European patent), DK (European patent), ES (European patent), FR (European patent), GB (European patent), GR (European patent), IT (European patent), JP, LU (European patent), MC (European patent), NL (European patent), SE (European patent). Published <i>With international search report.</i> <i>Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.</i> |

(54) Title: SEGREGATED FORMAT PROCESSING OF COMBINED TEXT AND PICTORIAL IMAGE DATA**(57) Abstract**

An imagery data and text formatting mechanism for an image processing system in which a color photographic image on a color slide is digitally encoded and stored in bit map format on a compact disc. Photographic image-representative digital data stored on the disc is readable to cause the generation of the image by an output device. When text is to be inserted into the image, an ASCII file, separate from the bit map formatted photographic image file, is incorporated into that part of the data base where control information is stored. The ASCII file contains a font descriptor and an identifier of where within the bit map the text is to be inserted. When imagery data stored on the disc is to be read out, for example, supplied to a high resolution thermal printer, a text-representative bit map file is generated in accordance with the contents of the ASCII file and combined with the bit map data file for the photographic scene image. Because the text is separate from the scene data, applying an image modifying operator to the scene will not corrupt the text or cause artifacts to be introduced into the scene as would occur with bit map text.



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**SEGREGATED FORMAT PROCESSING OF COMBINED TEXT AND
PICTORIAL IMAGE DATA**

FIELD OF THE INVENTION

The present invention relates in general to
5 digitized imagery data processing systems and is particularly directed to a mechanism for processing digital imagery data representative of text superimposed upon a photographic scene.

BACKGROUND OF THE INVENTION

10 Digital imagery processing systems, such as those employed for processing computer-generated graphics images or digitized photographic images, customarily create a bit map-formatted data file in the course of presenting the image to an output device,
15 such as a color printer. For computer-generated graphics applications, the actual content of the image is a 'don't care' to the application program, as both artwork and any included text are created and manipulated in accordance with a common graphics rule
20 set. For desktop publishing applications, where graphics or imported photographic images and text are assembled together in the same document, the image data is typically maintained in a bit map-formatted file separate from the word processing file through which
25 the text is generated, and each file is manipulated independently of the other until a desired document presentation is realized.

In photofinishing applications, where a photographic image of interest has been digitized in
30 bit map format, it is of ten necessary to carry out a number of image modification operations on the scene data (such as compression, expansion, edge emphasis, and texture corrections of facial features of a human subject) in order to achieve a desired image output
35 (e.g. print quality and size). If text is to be overlaid onto the scene, it is not added until after

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all scene processing has been completed, and then the combined image is printed. Text is not inserted until the end of the image processing sequence, since typical processing of the bit map of the photographic scene data creates artifacts (e.g. shadows around the text) and thus degrades the quality of the printed image.

In copending Patent application Serial Number _____, filed _____, by S. Kristy, entitled: MULTI-RESOLUTION DIGITAL IMAGERY PHOTOFINISHING SYSTEM, assigned to the assignee of the present application, and the disclosure of which is incorporated herein, there is described a photo processing system through which photographic images, such as those captured on 35mm slides, are stored in digital format, so that they may be processed on a computer workstation to achieve a desired base image characteristic. Once the base image has been prepared, it is written onto a transportable medium, such as a compact disc, for subsequent playback on a display device, for example a relatively moderate resolution consumer television set, or printed as a finished photocopy, as by way of a high resolution thermal color printer.

Because the output device to which the disc-resident base image data will be coupled is not necessarily identified at the time that the base image is prepared and stored on the disc, it can be expected that further processing of the stored image will be performed in the course of reproducing an image in its 'finalized' or 'finished' output form. For those images where text has been introduced into the scene during the preparation of the base image stored on the disc, conventional processing would have converted those pixel locations of the bit map of the base image where text has been inserted into text-representative bit map values, so that the scene-derived values at

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those pixel locations would have been lost. Thus, any further processing of the text-containing image data on the disc would treat text as though it were part of the scene. Consequently, since the text has attributes that are different from and make it stand out from the background scene (e.g. well defined edges) , the application of scene-based bit map processing operator to the entire image would introduce artifacts (shadowing) around the text and produce a degraded image, as pointed out above.

SUMMARY OF THE INVENTION

In accordance with the present invention, the above-described artifact-introducing problem of processing combined text-and-scene data together in a common bit map file is obviated by storing the photographic scene-derived portion of the base image data in a dedicated bit map file, on the one hand, and storing text data that is to be inserted into or overlaid on the scene image, as part of a non bit map-based standard code for information exchange (e.g. ASCII) file, on the other hand. In particular, the present invention is directed to an imagery data and text formatting and storage mechanism for a digitized image processing system, in which a color photographic image that has been captured on a color photographic image storage medium, such as a 35mm color slide, is digitally encoded and stored in bit ream format in a digital base, such as a digital compact disc. Photographic image-representative digital data stored on the disc is readable to cause the generation of the image by way of an array of pixels of an image output device.

Pursuant to the present invention, whenever text is to be inserted into the image, its ASCII file is incorporated into that part of the data base where control information relating to, but not forming part

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of, the photographic scene is stored. This ASCII file contains a font descriptor and a identifier of where within the scene bit map the text is to be inserted. When imagery data stored on the disc is to be read out, for example, supplied to a high resolution thermal printer for generating a hard copy print, a text-representative bit map file is generated in accordance with the contents of said ASCII file and combined with the bit map data file for the photographic scene image. The two data files are combined to produce a composite image by replacing those data components of the bit map data file for the scene image with those data components of the text-representative bit map file that are associated with image locations where text is to be superimposed on the slide scene. This combined bit map file is then coupled to the output device, which generates a text superimposed-on-scene image.

Whenever the overall image is to be modified in accordance with a selected image processing operator, its text-representative ASCII file is processed using the requisite ASCII code rule set, but corresponding to the manner in which the pixel data within the separate bit map data file for the photographic image is modified by a corresponding bit map image processing operator. By processing the text-representative data file in ASCII format separately from the scene image bit map file, the manner in which the scene-representative bit map file is processed will not corrupt the text. The two respective imagery data files for the text-inserted image of interest are then updated to produce modified bit map and ASCII files. Then, as described above, in the course of coupling the modified image to an output device, a text-representative bit map file is generated in accordance with the contents of the modified ASCII file and combined with the modified scene-representative bit map

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data file for the photographic image. Since both the scene-representative bit map data and the text-representative bit map data have been derived independently of one another, the resultant image does not suffer from text-induced artifacts. The combined modified image may then be supplied to a printer to obtain a modified high resolution hard copy version of the original text-inserted image.

BRIEF DESCRIPTION OF THE DRAWINGS

10 The single Figure is a diagrammatic illustration of a photo processing system employing the data file formatting and storage mechanism of the present invention.

DETAILED DESCRIPTION

15 Before describing the details of an embodiment of the present invention, it should be observed that the invention resides primarily in a novel photo and text imagery data formatting storage and processing mechanism, rather than a particular
20 implementation of that mechanism. Thus, although, in its preferred embodiment, the invention is implemented using a programmed digital computer, the mechanism may be carried out by means of a variety of structural combinations of conventional signal processing circuits
25 and components, such as custom-configured integrated circuit hardware. Accordingly, the structure, control and arrangement of the signal processing hardware of an embodiment of the invention have been illustrated in the drawings by a readily understandable block diagram,
30 which shows only those specific details that are pertinent to the present invention, so as not to obscure the disclosure with structural details which will be readily apparent to those skilled in the art having the benefit of the present description.

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Referring now to Figure 1, a photo processing system through which photographic images 10, such as those captured on 35mm color slides, are stored in digital format is diagrammatically illustrated as comprising an opto-electronic film scanner 12, such as a commercially available Eikonix Modal 1435 scanner. Scanner 12 outputs digitally encoded data representative of the response of its imaging sensor pixel array onto which a photographic image contained on a respective color slide is projected. This digitally encoded data or 'digitized' image is coupled in the form of a bit map to an attendant image processing workstation 14, which contains a frame store and image processing application software through which the digitized image may be processed (e.g. compressed, shaped, enlarged, rotated, cropped, subjected to a scene balance correction mechanism, etc.) to achieve a desired base image appearance and configuration. In accordance with the imagery data processing system described in the above referenced copending application, each captured image is stored in the form of a low resolution image and a plurality of residual images to enhance data processing speed. Regardless of the particular encoding and storage mechanism employed for digitizing the captured photographic image, the format of the data is that of a digitized image bit map 22, each low resolution pixel value of which has some prescribed code width (e.g. twenty-four bits or eight bits per color). Control information associated with selected modification of the image on the operator's workstation (e.g. a 90° rotation) is stored in non-bit map formatted file 24 separate from the scanner's output bit map, so that when the manipulated image is written to an output storage medium (e.g. a compact disc) that control information may be accessed by a display or print device.

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As pointed out briefly above, in accordance with the present invention, whenever text is to be inserted into the image via the operator's workstation (e.g. by use of the workstation keyboard 15 or a mouse 16, an ASCII file is incorporated into that part of the data base 24 where control information for the photographic scene is stored. The text-representative ASCII data file contains a font descriptor and an insert-location identifier which specifies where, within the image bit map, text is to replace scene pixel data.

Once operator-processing of the image has been completed, both the bit map file 22 and the control/text file 24 are written to suitable portable storage medium, such as a digital compact disc 26. After one or more sets of color slides have been digitized and stored on the disc, the disc may be coupled to an output device, such as a playback unit 32 employing a low to moderate resolution color display monitor 34, or to a high resolution print engine 36, such as a thermal color printer.

When imagery data is read from the disc, for example, supplied to a high resolution color thermal printer for generating a high resolution hard copy print, a text-representative bit map file is generated and stored in auxiliary buffer storage within the print engine in accordance with the contents of the ASCII file. This auxiliary file may then be summed with the bit map data file for the scene image of interest, to effect a replacement of those data components of the scene bit map data file for the scene image with those data components of the text-representative bit map file that are associated with image locations where text is to be superimposed on the scene image, thereby producing a combined 'text-on-scene' bit map data file.

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This combined bit map file is then coupled to the print engine, which generates a print of the slide image in which text has been inserted.

A key aspect of the text formatting and storage mechanism of the present invention is the fact that the output device to which the disc-resident base image data may be delivered is not necessarily identified at the time that the base image is prepared and stored on the disc, and it may be necessary to perform further processing of the stored image in the course of producing an image in a 'finalized' or 'finished' output form. As described above, for scene images where text is introduced during the preparation of the base image stored on the disc, conventional processing would have converted those pixel locations of the bit map of the base image where text has been inserted into text-representative values, so that the photo-derived values at those pixel locations would have been lost. Accordingly, further processing of the text-containing image data on the disc would treat text as though it were part of the scene and subject the output print to artifacts (e.g. shadowing around the text) and produce a degraded image, as pointed out above. However, with the separate formatting/storage mechanism of the present invention, this problem has been obviated. If the imagery data on the disc is to be modified (e.g. by way of a spatial filtering operator to improve a prescribed aspect of the scene or a size change) the modification operation does not impact the text or pixel locations of the image adjacent to those where the text is inserted. For a size change, the text is modified by simply changing point size in its ASCII file. The two respective imagery data, disc-resident files for the text-inserted image of interest are then updated with modified bit map and ASCII files. Then, as described above, in the

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course of coupling the modified image to an output device, a text-representative bit map file is generated in accordance with the contents of the modified ASCII file and combined with the modified scene-

5 representative bit map data file for the photographic image. Since both the scene-representative bit map data and the text-representative bit map data have been derived independently of one another, the resultant image does not suffer from text-induced artifacts.

10 While I have shown and described an embodiment in accordance with the present invention, it is to be understood that the same is not limited thereto but is susceptible to numerous changes and modifications as known to a person skilled in the art,
15 and I therefore do not wish to be limited to the details shown and described herein but intend to cover all such changes and modifications as are obvious to one of ordinary skill in the art.

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WHAT IS CLAIMED

1. For use with a digitized image data processing system in which a text image is superimposed upon a non-text image to form a composite image for presentation to an image output device, a method of modifying a characteristic of said composite image comprising the steps of:
 - a) storing data representative of said text image as a first data format type data file separate from data representative of said non-text scene image;
 - b) storing data representative of said non-text scene image as a second data format type data file, different from said first data format type data file;
 - c) modifying said data representative of said text image by manipulating said first data format type data file in accordance with the intended modification of the characteristic of said composite image; and
 - d) modifying said data representative of said non-text scene image by modifying said second data format type data file in accordance with the intended modification of the characteristic of said composite image.
2. A method according to claim 1, wherein said first data format is ASCII format and said second data format is bit map format.
3. A method according to claim 2, wherein step (c) comprises generating a text image bit map file in accordance with the contents of the ASCII file that has been manipulated in accordance with the intended modification of the composite image, and further including the step of:
 - e) combining the bit map data file for said non-text scene image with said text image bit map file by replacing those data components of the bit map file

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representative of said non-text scene image that has been modified in step (d) with those data components of said text image bit map file associated with image locations where text image is superimposed on said non-text scene image.

4. For use with a digitized image processing system in which a color photographic image that has been captured on a color photographic image storage medium is digitally encoded and stored in bit map format in a digital base, photographic image-representative digital data stored in said data base being accessible to cause the generation of said image by way of an array of pixels of an image output device, a method of inserting text into the image generated by said image output device, comprising the steps of:

a) storing data representative of the text to be inserted into said image as an ASCII file separate from the bit map format photographic image file in said digital data base;

b) generating a text-representative bit map file in accordance with the contents of said ASCII file;

c) combining the bit map data file for said photographic image with said text-representative bit map file by replacing those data components of the bit map data file for said photographic image with those data components of said text-representative bit map file generated in step (b) that are associated with image locations where text is to be superimposed on said photographic image to produce a combined bit map data file;

d) generating a text superimposed-on-photographic image by way of said image output device in accordance with the contents of said combined bit map data file.

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5. A method according to claim 4, further including the step of:

e) modifying the text superimposed-on-photographic image generated by way of said image output device to achieve a prescribed change of said text superimposed-on-photographic image by the steps of:

- e1) modifying the ASCII file stored in step (a) in accordance with said prescribed change;
- 10 e2) modifying the bit map data file for said photographic image in accordance with said prescribed change;
- e3) performing step (b) with respect to the ASCII file modified in step (e1);
- 15 e4) performing step (c) with respect to the text-representative bit map file obtained by step (e3) and the photographic image bit map file obtained by step (e2); and
- e5) performing step (d) with respect to the combined bit map data file obtained by step (e4).
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6. A method according to claim 4, wherein said image output device comprises a printer, and step (d) comprises driving said printer in accordance with the contents of said combined bit map data file, so that said printer prints said photographic image with inserted text.

7. A method according to claim 4, wherein said image output device comprises a video display device and step (d) comprises driving said video display device with the contents of said combined bit map data file, so that said video display device displays said photographic image with inserted text.

8. For use with a digitized image data processing system in which a text image is inserted into a photographic scene image to form a composite

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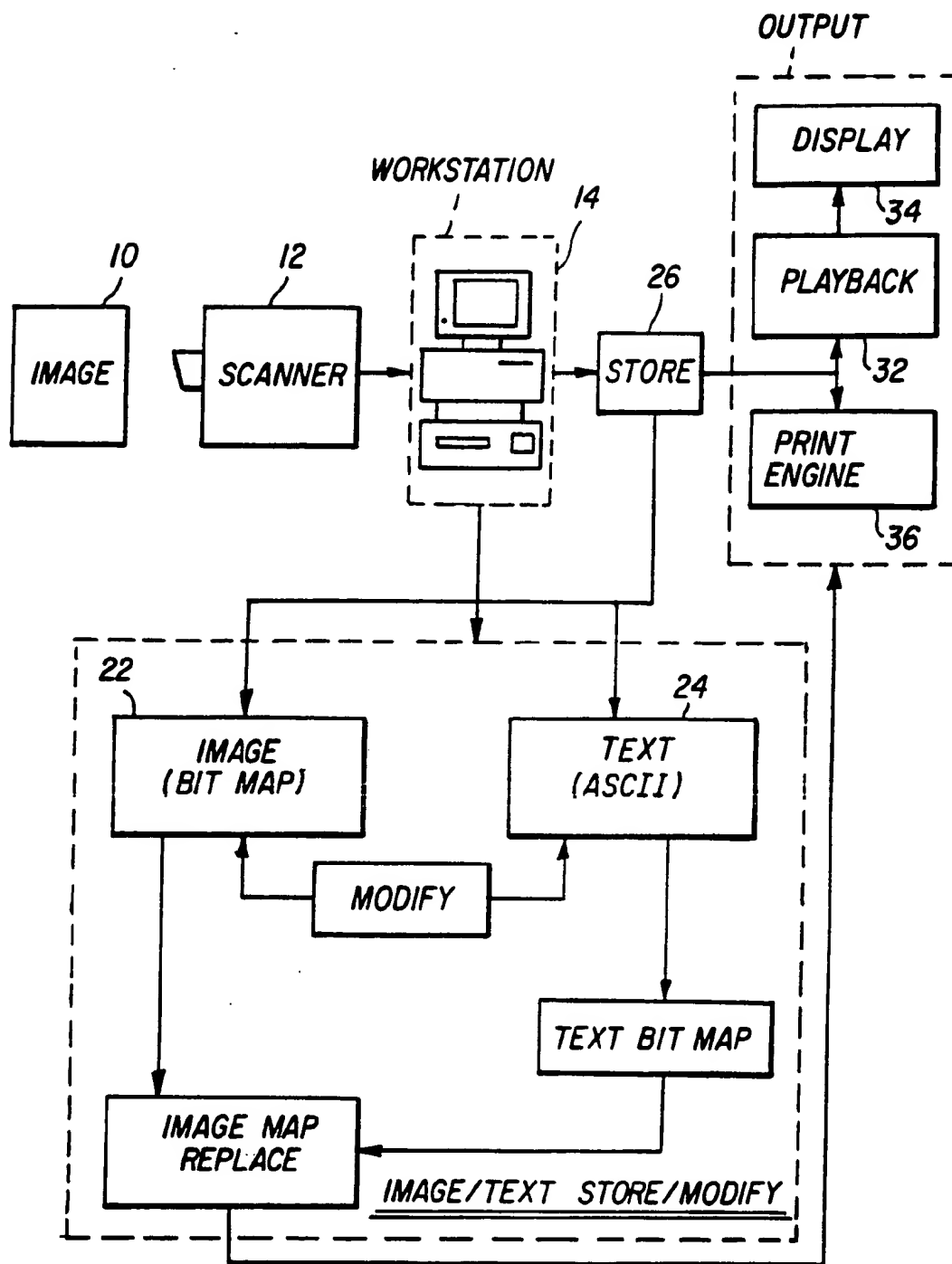
text-on-scene image for presentation to an image output device, a method of modifying a characteristic of said composite text-on-scene image comprising the steps of:

- a) storing data representative of said text
5 image as an ASCII code file separate from data representative of said photographic scene image;
- b) storing data representative of said photographic scene image as a bit map data file;
- c) modifying said ASCII code file in
10 accordance with the intended modification of said composite image; and
- d) modifying said data representative of said photographic scene image by modifying its bit map data file in accordance with the intended modification
15 of the characteristic of said composite image.

9. A method according to claim 8, wherein step (c) comprises generating a text image bit map file in accordance with the contents of the ASCII code file that has been modified in accordance with the intended
20 modification of the composite image, and further including the step of:

- c) combining the bit map data file for said photographic scene image with said text image bit map file by replacing those data components of the
25 photographic scene bit map file that has been modified in step (d) with those data components of said text image bit map file associated with image locations where text image is superimposed on said photographic scene image.

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INTERNATIONAL SEARCH REPORT

International Application No

PCT/US 91/09560

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|---|---|-------------------------------------|
| I. CLASSIFICATION OF SUBJECT MATTER (If several classification symbols apply, indicate all) ⁶ | | |
| According to International Patent Classification (IPC) or to both National Classification and IPC | | |
| Int.Cl. 5 H04N1/387 | | |
| II. FIELDS SEARCHED | | |
| Minimum Documentation Searched ⁷ | | |
| Classification System | Classification Symbols | |
| Int.Cl. 5 | H04N ; G06F | |
| Documentation Searched other than Minimum Documentation to the extent that such documents are included in the fields searched ⁸ | | |
| III. DOCUMENTS CONSIDERED TO BE RELEVANT⁹ | | |
| Category ¹⁰ | Citation of Document, ¹¹ with indication, where appropriate, of the relevant passages ¹² | Relevant to Claim No. ¹³ |
| X | EP,A,0 109 038 (WANG LABORATORIES INC.) 23 May 1984 see abstract; figures 1,2 see page 8, line 14 - page 9, line 5 see page 21, line 4 - line 11 see page 22, line 4 - page 23, line 9 --- | 1-9 |
| A | EP,A,0 371 005 (CANON K.K.) 30 May 1990 see abstract; figures 3,4,6 see column 5, line 11 - column 6, line 7 --- | 1,2,4-6, 8 |
| A | US,A,4 672 459 (KUDO) 9 June 1987 see abstract; figures 2,3,4,5 see column 3, line 61 - column 6, line 39 --- | 1,3,4,8 |
| <p>¹⁰ Special categories of cited documents:</p> <p>"A" document defining the general state of the art which is not considered to be of particular relevance</p> <p>"E" earlier document but published on or after the international filing date</p> <p>"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)</p> <p>"O" document referring to an oral disclosure, use, exhibition or other means</p> <p>"P" document published prior to the international filing date but later than the priority date claimed</p> <p>"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention</p> <p>"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step</p> <p>"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art</p> <p>"A" document member of the same patent family</p> | | |
| IV. CERTIFICATION | | |
| Date of the Actual Completion of the International Search | Date of Mailing of this International Search Report | |
| 07 MAY 1992 | 20. 05. 92 | |
| International Searching Authority | Signature of Authorized Officer | |
| EUROPEAN PATENT OFFICE | REVELLIO H.S. <i>Revello</i> | |

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**ANNEX TO THE INTERNATIONAL SEARCH REPORT
ON INTERNATIONAL PATENT APPLICATION NO. US 9109560
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This annex lists the patent family members relating to the patent documents cited in the above-mentioned international search report. The members are as contained in the European Patent Office EDP file on
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